

Restoring Free-flowing Rivers

Bringing Down the Dams

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Water cascading over a dam and the tranquil calm of the water behind it can be a sight and sound to behold. Dams and the water they impound can provide drinking water, recreation, irrigation, power and other economic benefits. While these benefits are real, the negatives of damming a river are often overlooked.

Lasting Legacy

Rivers and streams once flowed freely in New Jersey, or nearly so, except for blockages caused by beaver dams and fallen trees. The dams initially built by European settlers to power saw mills, forges and grist mills were small and scattered. As manufacturing processes evolved and our population grew, so too did the need to “tame” rivers. As people prospered and new modes of transportation improved their mobility, savvy real estate investors built dams on smaller streams and swamps to create attractive recreational lakes coveted by vacationers and home buyers.

Before



Pat Hamilton/NJDFW

Removal of the Gruendyke Mill Dam on the Musconetcong River in Hackettstown (2008).

There are nearly 1,700 regulated dams in New Jersey (i.e., greater than 5 feet in height or, in the Pinelands, higher than 8 feet) and an untold number of smaller, unregulated dams (<5 feet in height). Regulated dams fall under state jurisdiction, meaning there are laws relating to their construction, repair and inspection. Most of the dams in New Jersey are less than 25 feet high and greater than 50 years old. Many have been impeding the natural flow of our rivers and streams for more than a century. Surprisingly, only a small fraction of New Jersey’s dams provide hydropower (<2 percent) or flood control (<6 percent) according to the U.S. Army Corps of Engineers’ National Inventory of Dams—yet these functions are the ones that most people associate with dams.

Dams Impact River Ecosystems

Think of a river as a living, dynamic entity. Trickles of water emerging from seeps, springs and swamps unite, giving birth to flowing water in headwater areas of streams and rivers. Though shaped by the forces of this flowing water, our rivers do so much more than simply convey water, as complex biological and physical processes are continuously at work. Dams negatively affect the health of river by:

- Disrupting the natural flow regime and slow the movement of water.
- Impacting water quality such as temperature and dissolved oxygen.
- Altering the transport of sediment, causing abnormal sediment accumulation upstream. Existing plant and animal species may be replaced by those more tolerant of this altered habitat.

- Obstructing fish migration and movement
 - Decreasing connectivity, causing fragmentation of the river corridor, isolating aquatic habitats and biotic communities along with floodplains.
 - Reducing habitat complexity.
- Although dams can be retrofitted with fish ladders to help mitigate fish passage issues, the ladders must be properly designed and maintained, like the one for alewives at Union Lake dam on the Maurice River. Fish ladders are costly to construct and do not alleviate other negative effects from dam.

Benefits of Dam Removal

Dams are a visible reminder that human activities within a watershed can have long-term consequences for a river ecosystem. When dams come down the benefits include:

- **Restore free-flowing conditions**—Allows for recovery of natural riverine processes responsible for creation and maintenance of habitat.
- **Improve water quality**—Seasonal and weather-induced flows, temperatures and oxygen levels return to their natural variations and normally associated flora and fauna.
- **Enhance connectivity for movement of resident and migratory fish**—Pathways for migratory fish species such as American shad, alewife, blueback herring, striped bass, and American eel may be restored.
- **Reconnected floodplains, habitats and aquatic habitats**—When dams come down, upstream and downstream areas within and adjacent to rivers are reconnected.
- **Improve sediment release and transport**—Water flow and turbulence revert to normal, distributing sediment naturally.
- **Enhanced public safety**—Even a properly maintained dam can be a safety hazard, especially for recreational users like anglers and boaters. Removal eradicates the risk of injury, loss of life and property destruction from dam failure.
- **Eliminated maintenance/repair costs**—Over time, dam removal is less expensive.

“Rarely when working in natural systems do we get the opportunity to see such immediate, measurable and permanent results for our efforts.”

Beth Styler-Barry,
September 8, 2016, then Executive Director
Musconetcong Watershed Association
Musconetcong.org

Dam Removals Gaining Traction

Our long-standing relationship with dams is beginning to show some cracks. Dam removal was not widely recognized as a means to address unsafe, unwanted or obsolete dams until the mid-to-late 1980s. The first recorded dam removal in New Jersey occurred in 1985 on Hollow Brook near Pottersville.

Only a handful of additional removals occurred between 1985 and the mid-1990s, when the National Park Service removed several dams as part of their agency’s plan to “maintain or drain” impoundments. These removals were largely driven by dam safety issues. Since then, dam removal has also become an increasingly popular approach for restoring rivers. According to records compiled by the non-profit organization American Rivers, with the assistance of the New Jersey DEP Bureau of Dam Safety, 34 dams were removed in New Jersey between 1985 and 2015. New Jersey currently ranks 10th among states for the total number of dams removed.

It was not until 2006 that New Jersey saw its first dam removal with the explicit goal of river restoration – the removal of Pursel’s Mill Dam on Lopatcong Creek in Phillipsburg. This 8.3-foot high dam was built in 1927 to replace a lock on the defunct Morris Canal and provide water for a working mill owned by Henry Pursel. Over time

After



Musconetcong River Watershed Association

Musconetcong River in Hackettstown after Gruendyke Dam removal.



Dave Beam/NJDEP

Removal of the Robert Street Dam on the Raritan River (2008) helped clear the way for migrating American shad, striped bass, American eel and river herring.

the dam outlived its original purpose.

Because it had begun to deteriorate and became a liability, the Pursels agreed to remove most of the structure. This dam was the only blockage on Lopatcong Creek; its removal opened 10 miles of new habitat for American eel and other migratory fish species. The open waterway also improved habitat and connectivity for the resident wild trout population. This notable project ushered in the use of dam removals as a tool to restore rivers in New Jersey, bringing together a suite of partners that continue to drive removal projects today.

Partnerships – Getting the Job Done

Not all dams are good candidates for removal, but those that are share several features in common: 1.) the dam no longer serves a purpose, 2.) the owner is facing prohibitively expensive maintenance or repair costs and/or is concerned about public safety and liability associated with the dam, and 3.) the ecological benefits of removal outweigh any advantages to keeping the dam. In situations like these, an owner may choose to work with organizations and agencies interested in bringing down the dam and restoring the river.

In New Jersey, successful dam removal projects are often the result of partnerships between nonprofit organizations, federal and state agencies plus others working together toward the common goal of river restoration. For example, over the past eight years the Musconetcong River Restoration Partnership, led by the Musconetcong Watershed Association, has championed the successful removal of five obsolete dams on this 42-mile-long tributary to the Delaware River including the Seber, Gruendyke Mill, Riegelsville, Finesville and Hughesville dams. The Partnership "... is a superb example of collaborative conservation" remarked Sally Jewell, Secretary of the U.S. Dept. of Interior when she toured New Jersey to observe the breaching of the Hughesville Dam.

The strength of this partnership, and others like it, relies upon participating nonprofit organizations like the Musconetcong Watershed Association, American Rivers, Trout Unlimited, as well as federal and state agencies such as NOAA, US Fish and Wildlife Service, the U.S.D.A.'s Natural Resources Conservation Service, the Army Corps of Engineers and multiple New Jersey DEP programs.

Challenges of Dam Removal

Just as damming a river can be a life-altering event, so too can be its removal. The main considerations for every dam removal project, as compiled by American Rivers and other dam removal experts, include:

- Dam owner concurrence—A willing and cooperative landowner is key.
- Project funding—Dam removal can be expensive; often outside funding must be obtained.
- Sediment and contaminant release—A huge logistical challenge is managing the sudden release of years of sediment and silt built up behind a dam. In free-flowing rivers, this material would have been transported and deposited naturally over time and space.
- Hydrologic effects—Changes such as water elevation, velocity, flooding and more.
- Impacts on plant and animal abundance, diversity—Protection of native/threatened/

endangered species; prevention of exotic plant and animal species from invading upstream areas and impacting native communities.

- ♦ Social impacts—Residents may regard the dam beneficial, an iconic part of their local community. Removal can be delayed or derailed by skeptical residents not swayed by the ecological merits of the project, by those resenting outside interference or simply to resist change.
- ♦ Cultural preservation—Where historical features are present, often these must be retained to preserve the spirit of a way of life long-since passed.
- ♦ Infrastructure impacts—Existing bridges, utilities, etc. can be affected.
- ♦ Monitoring—Assess the outcome of a dam removal to determine if goals were achieved.

The Future of Dam Removals

Many dams still remain, a lasting testament to the past when humans dared to tame the forces of water and won. Dam removal can enhance aquatic habitats, help restore plant and wildlife species diversity and abundance, provide recreational and economic opportunities, ensure human safety and reclaim the natural function of a river.



Successful Dam Removals (2006 – 2016)

Raritan River

Calco Diffusion Weir Dam - removed 2011
(3.2 ft. high by 245 ft. wide)

Roberts Street Dam - removed 2012
(6.5 ft. high by 255 ft. wide)

Nevius Street Dam - removed 2013
(3.5 ft. high by 195 ft. wide)

Musconetcong River

Hughesville Dam - removed 2016
(18 ft. high by 150 ft. wide)

Riegelsville Dam – dam remnants removed 2011

Finesville Dam - removed 2011 (9 ft. high by 109 ft. wide)

Seber Dam - removed 2009 (4 ft. high by 100 ft. wide)

Gruedyke Mill Dam – removed 2008
(7 ft. high by 150 ft. wide)

Hakihokake Creek (Milford Brook)

Milford Dam – removed 2012 (8 ft. high by 80 ft. long)

Lopatcong Creek

Pursel's Mill Dam - removed 2006
(8.3 ft. high by 85 ft. wide)

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